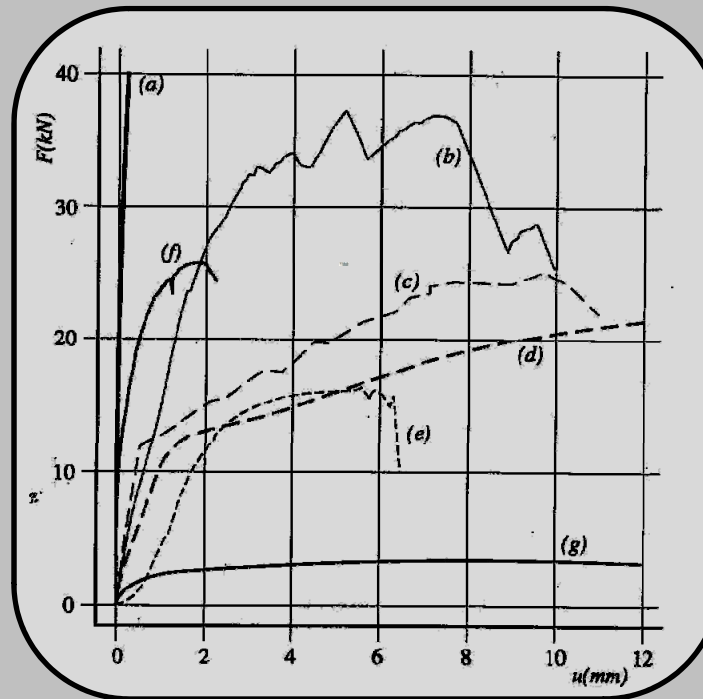
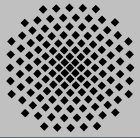


Possibility of stress redistribution due to connection ductility within timber structures



Frank Brühl

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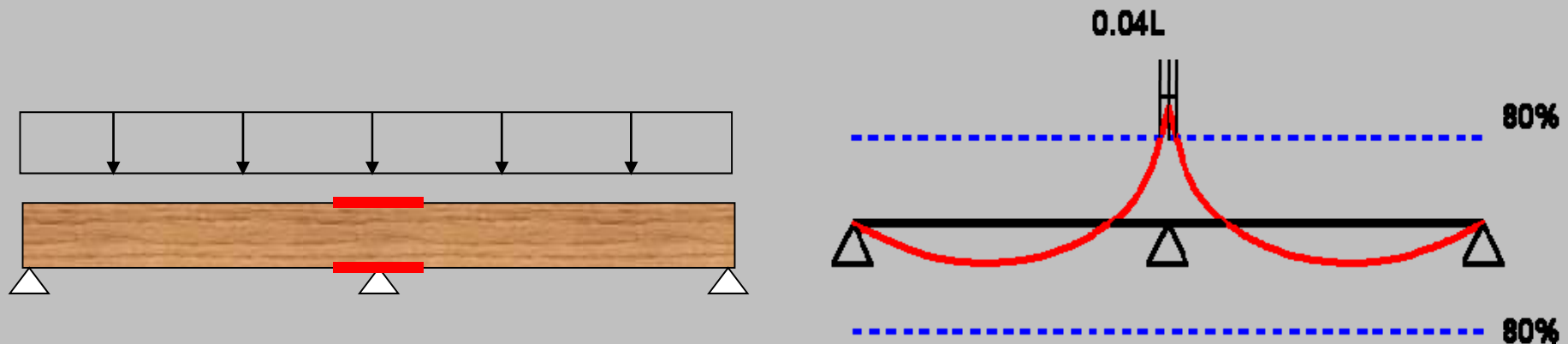
Motivation

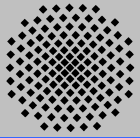
In statically undetermined systems

~ the cross section is only partially highly utilized

~ other parts of the structure are hardly stressed

→ Structural elements are designed for the highest local stresses





Motivation

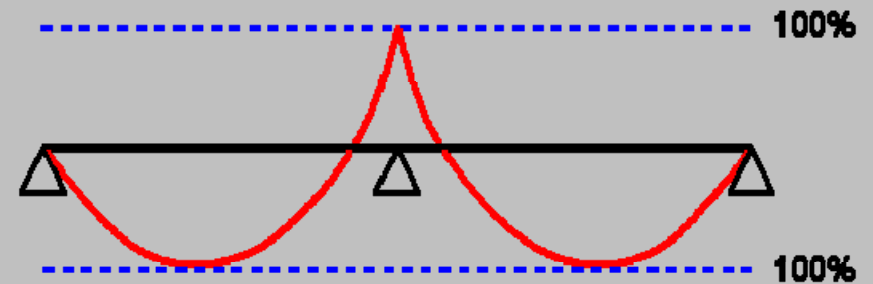
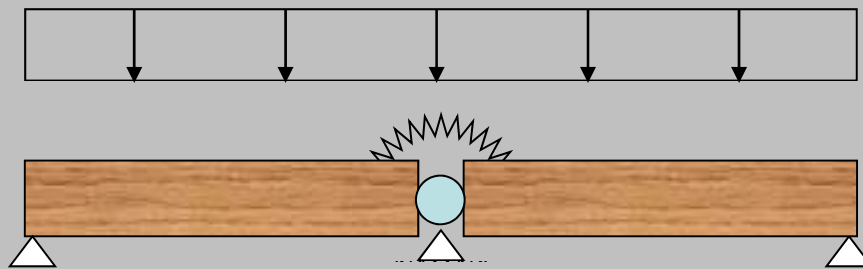
~ stress redistributions in statically undetermined systems

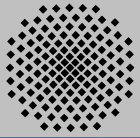
→ increased load capacity of the structure

e. g. two-span beam:

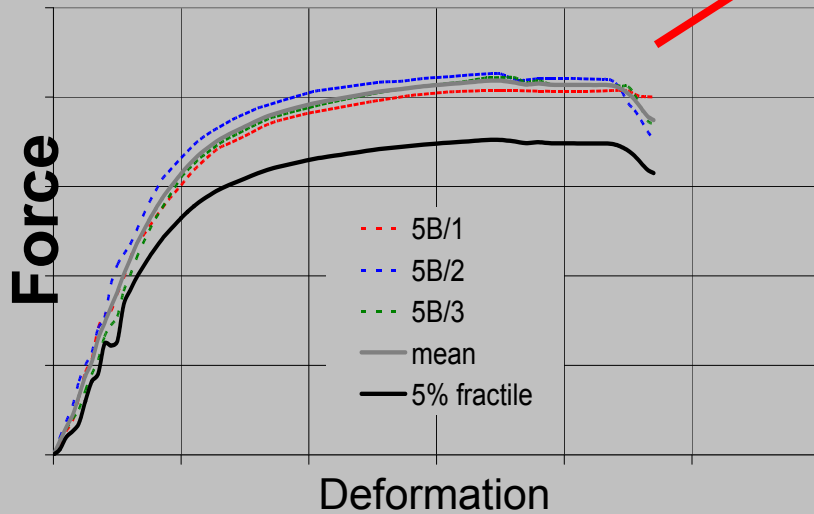
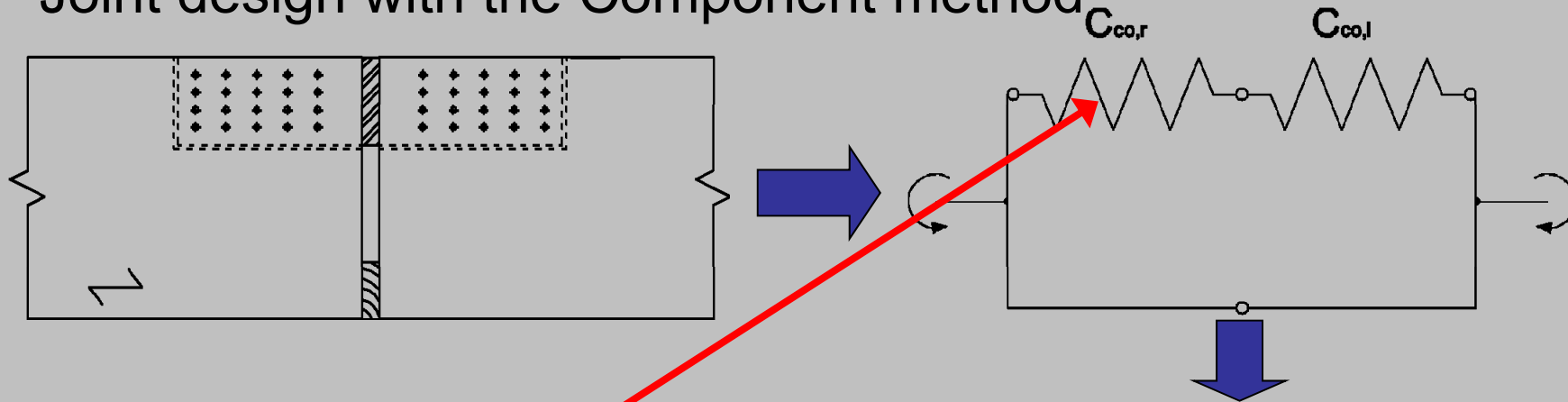
$$M_{\text{Support}} = M_{\text{Midspan}} = M_{\text{max}}$$

achievable by the installation of a joint with a defined strength and stiffness

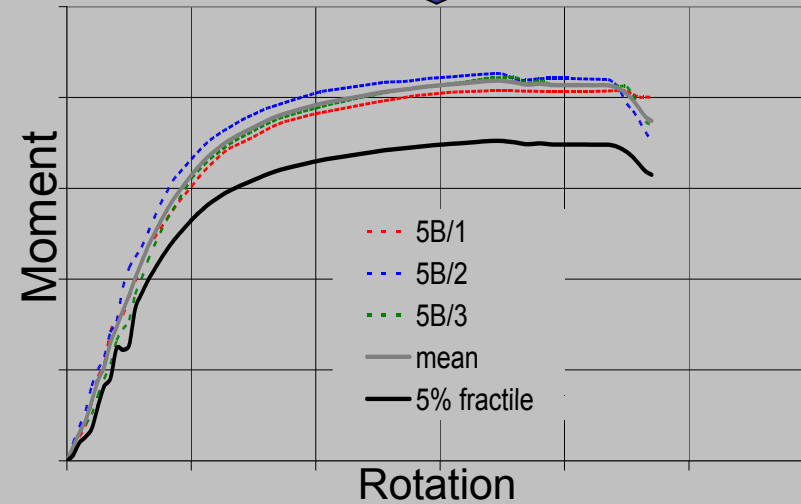




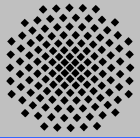
Joint design with the Component method



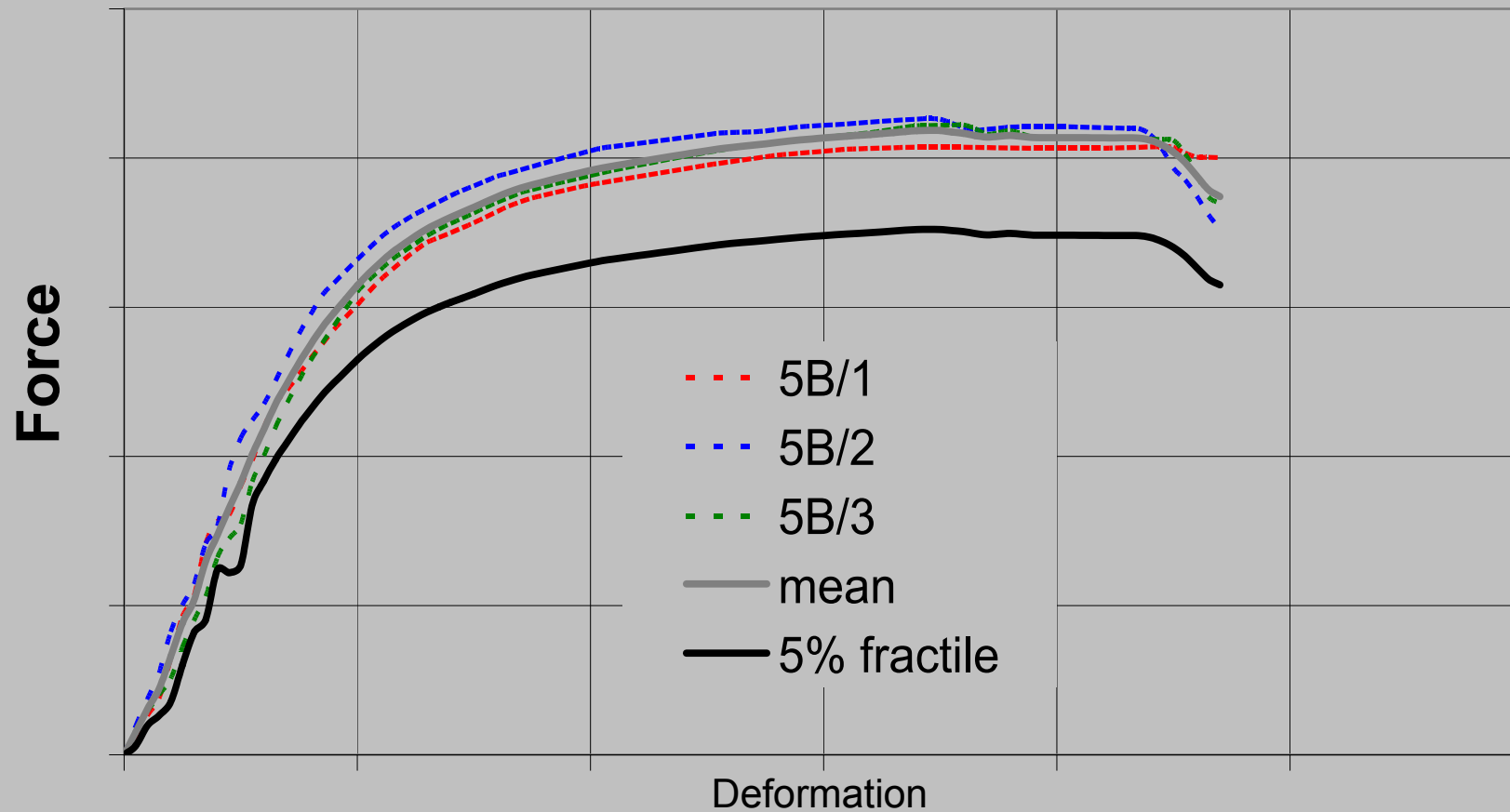
Load – slip relation of SFS (5mm)
[Mischler 2001]

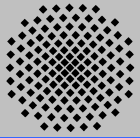


Moment – rotation relation of the joint

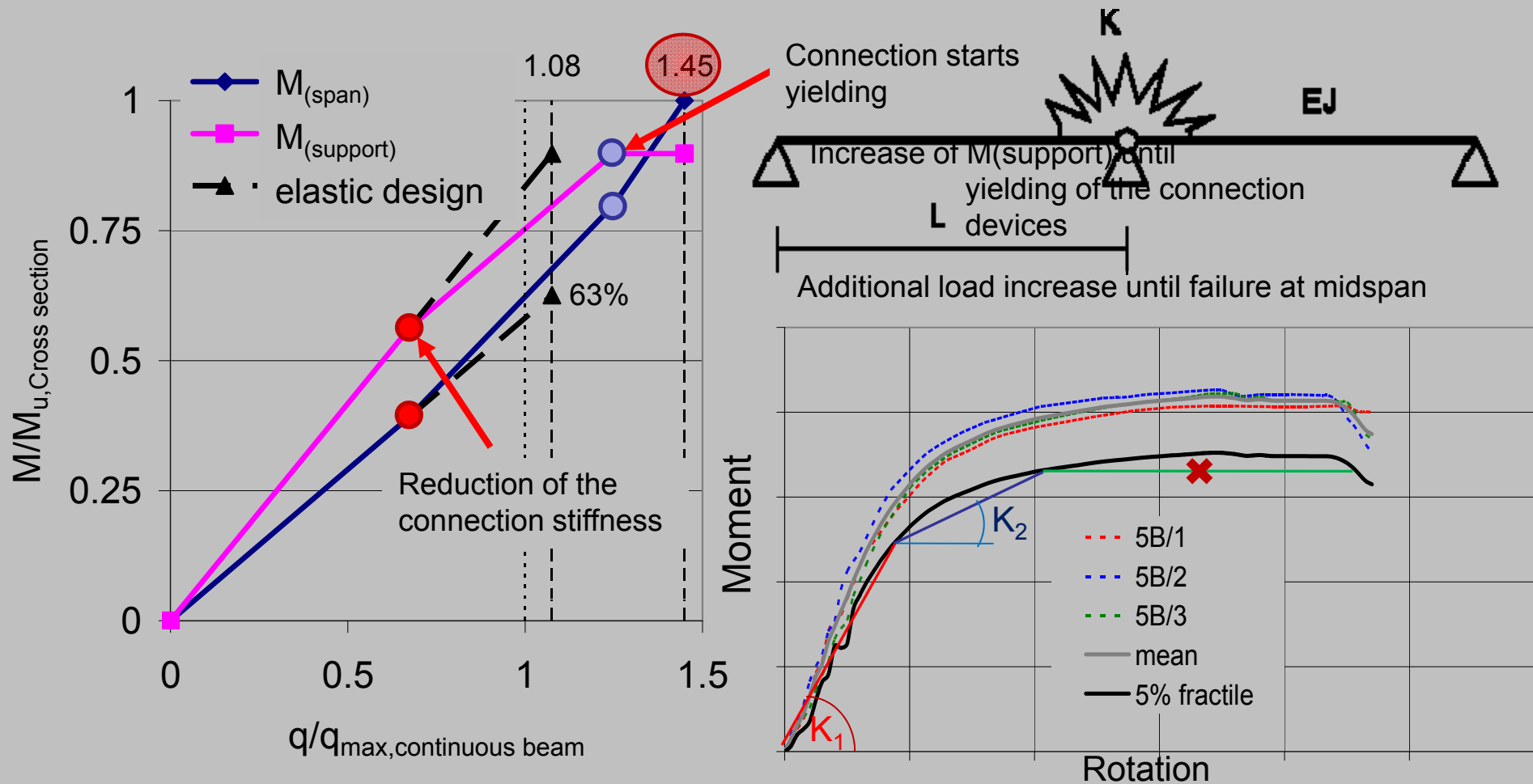


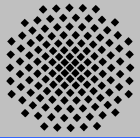
Load - deformation curve of SFS-dowels [Mischler 2001]



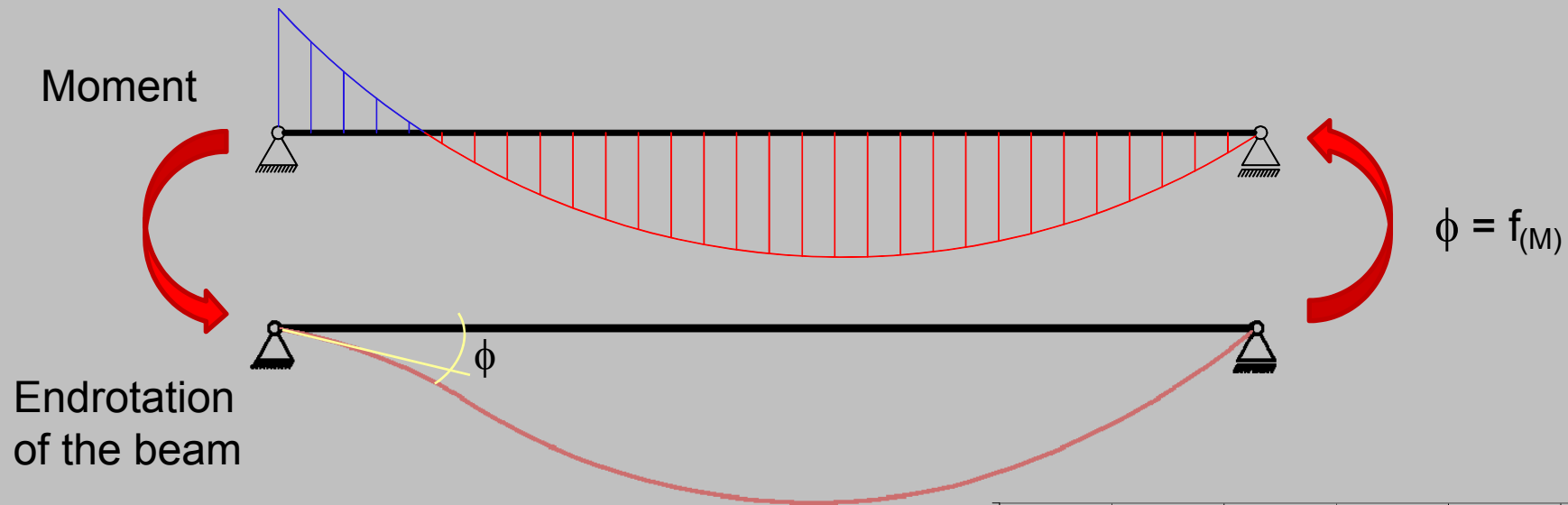


Joint consideration with SFS-dowels [Mischler 2001]



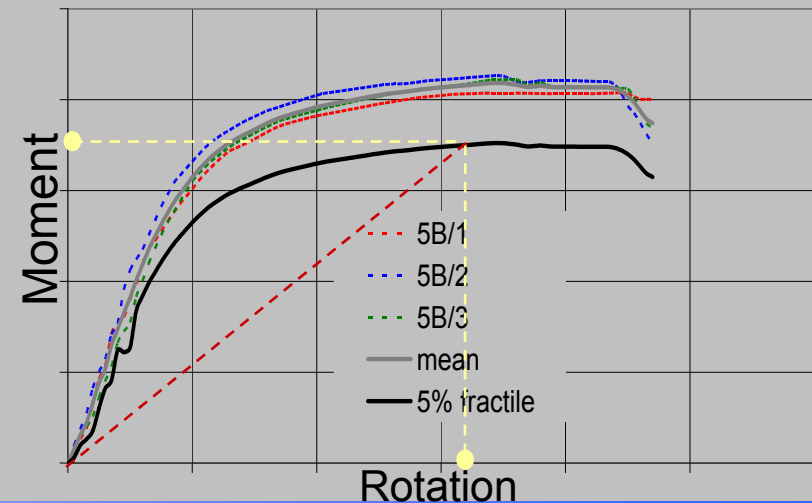


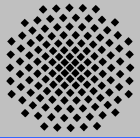
Requirements („Beam-Line“-Method)



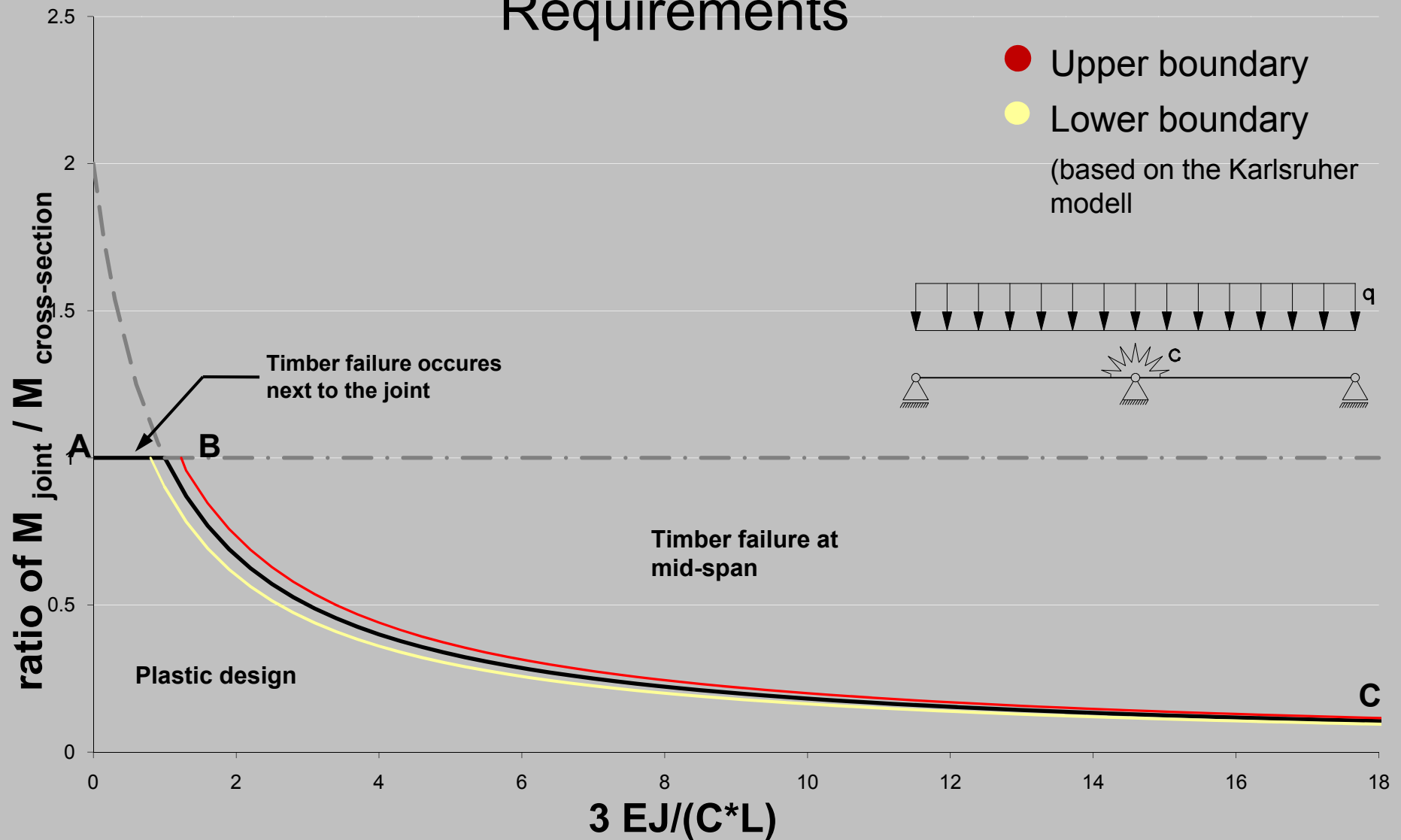
No influence of the *moment - rotation* relation as long as

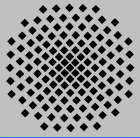
- the presumed moment can be transferred at a certain rotation of the beam
- the maximum load capacity has not reached before the defined rotation





Requirements

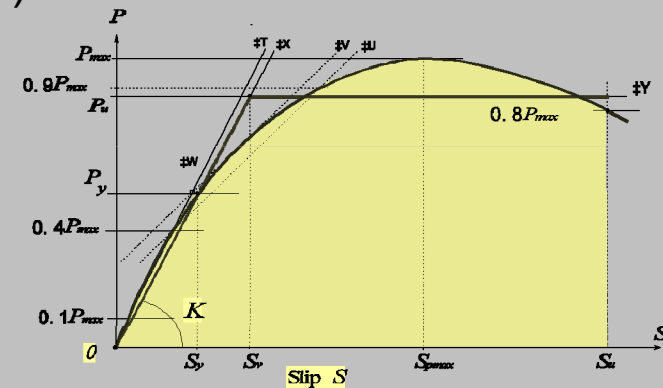




Conclusions

- ~ Database of connections is required
 with the load / deformation capacity of different type of fasteners
 definition of ductility (Komatsu et al. / CIB W18)

Type of fastener	F_{max}	$s_{(el)} @$ SLS	$s_{(el)} @$ $0.8 F_{max}$	$s_{(pl)} @$ $0.8 F_{max}$
...



- ~ Stress redistribution is possible

→ load increase is possible

two-span beam ~ +50% of the load capacity compared to a rigid system

→ Design considering the plastic behavior of fasteners is possible